MULTIMEDIA UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2017/2018 SESSION

TDS 3301 – DATA MINING

(All Sections / Groups)

05 MARCH 2018
2:30 p.m – 4:30 p.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 4 printed pages including cover page with 4 questions only.
2. Attempt **ALL** questions. All questions carry equal marks and the distribution of marks for each question is given.
3. Please write all your answers in the Answer Booklet provided

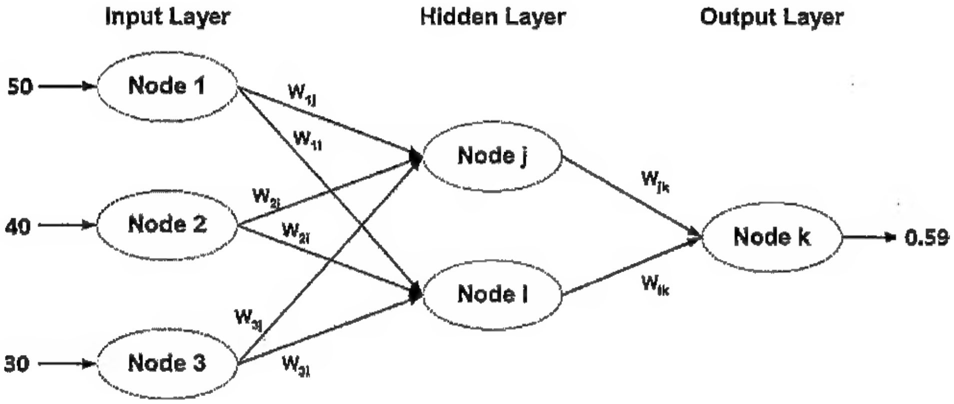
Question 1

a) Provide an example of data mining application and describe in brief the data mining approach used in
   i. market analysis (2 marks)
   ii. fraud detection. (2 marks)

b) Are all patterns found using data mining approaches interesting? What are the criteria of interesting patterns? Use association rule mining to explain your answer. (4 marks)

c) Sometime it is too heavy for human to look at all the possible patterns in a large data. Suggest a method to find only the interesting patterns. (2 marks)

Question 2



A Neural Network (NN) is given as above. The initial weights are W_{1j}=*0.2*, W_{1i}=*0.1*, W_{2j} *0.3*, W_{2i} = *-0.1*, W_{3j}= *-0.1*, W_{3i}=*0.2*, W_{jk} =*0.1 and* W_{ik} =*0.5*. Question (a) to (c) are about feed forwarding of this NN. Give your answer for the following questions up to 3 decimals only.

a) Normalise the inputs to the nodes using min-max normalization, where the minimum and maximum values are, 10 and 50, respectively. Why normalization is important in training a NN? (3+1 marks)

b) The inputs are mapped with the multiplication of vectors and a sigmoid function. Assuming output from node *j* and node *i* are, 0.593 and 0.531, respectively. What is the output from node *k*? (2 marks)

c) Compute the observed error at the output layer of the NN. (1 mark)

d) What is the best rule to the best number of hidden layer nodes? (1 mark)

e) Suggest a solution if a trained NN has an unacceptable accuracy. (2 marks)

Continued...

Question 3

The data for an attribute *X* are: 3.13, 4.53, 4.98, 5.09, 5.44, 6.11, 6.50, 6.68 and 7.22.

a) Draw a boxplot to show the distribution of the data. Label the five important values of the data in the boxplot. (6 marks)

b) Are the data normally distributed? Plot a Q-Q plot and check using the plot by pairing x_i to f_i, where $f_i=(i-0.5)/N$. (4 marks)

Question 4

	X	¬X
Y	100	1,000
¬Y	1,000	100,000

a) The 2-way contingency table of two items, *X* and *Y*, is as shown above.

i) An association rule is generated, $X \rightarrow Y\ (s,c,l)$. Calculate the support (*s*), confidence (*c*) and lift (*l*). (3 marks)

ii) What is the function of lift measure in association rule mining? (1 mark)

iii) Is the lift measure suitable in this case? Why or why not? (2 marks)

a	b	←Classified as
7	2	a=yes
4	1	b=no

b) Fill in the following table based on information in the confusion matrix above.

i) How many records are correctly classified? (1 mark)

ii) The Recall is the proportion of examples which were classified as class *x*, among all examples which truly have class *x*. So, what is the Recall for class *no*? (1 mark)

iii) The Precision is the proportion of the examples which truly have class *x* among all those which were classified as class *x*. What is the Precision of class *yes*? (1 mark)

iv) Usually what will happen when you try to improve either Recall or Precision? (1 mark)

Continued...

Formulae:

Min max normalization, $new\ value = \frac{original\ value - minimum\ value}{maximum\ value - minimum\ value}$

Sigmoid function, $(x) = \frac{1}{1+e^{-x}}$, where e is 2.718282.

Back propagation of errors at output layer, $error(k) = (T - O_k)O_k(1 - O_k)$, where T is target output and O is the output of a node.

Support, *s*, is the probability that a transaction contains X U Y

Confidence, $c = \frac{\sup(X\ U\ Y)}{\sup(X)}$

Lift, $l = \frac{\sup(X\ U\ Y)}{sup(X)sup(Y)}$

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